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Consumption and Trends in the Use of Fertilizer in the Year Ended June 30, 1944

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[1] Credit is due to W. F. Watkins, formerly chief, Fertilizer Requirements Section, Office of Materials and Facilities, War Food Administration, for preparing and mailing the questionnaires in the fall of 1943, and to T. L. Jeffries, his successor, for similar services with respect to collection of the data for the first half of 1944.

FERTILIZERS are of greater importance to agriculture now than ever before. The war created increased demands on this country for food, feed, and other crops and at the same time took part of the best manpower off the farm. It also caused dislocations in supplies of materials available to make commercial fertilizers. For example, certain imports were cut off and exports not previously made were created. At the beginning of the war the nitrogen needed for fertilizers had to be diverted to the manufacture of munitions. As rapidly as possible new synthetic nitrogen plants were built.

With the war over, these plants can produce much more nitrogen than can be efficiently used. Wise use of the available supplies is important in planning to take care of our future needs for food and other agricultural products. Proper planning toward this end requires among other things detailed knowledge of the extent of previous use of fertilizers as well as of the prospective needs and probable supplies to meet these needs.

This circular is based in part on questionnaires collected by the War Food Administration, on information from publications of various States, and on many other sources. The figures presented give some details of the use of fertilizers by States in the year ended June 30, 1944. The results of the survey afford an opportunity to study present trends in use and some effects of the war, by comparison with statistics for earlier periods.

It is hoped that this circular will assist both Government and industry in formulating policies and in making recommendations for the future.

FERTILIZER SURVEY FOR THE YEAR ENDED JUNE 30, 1944

The total consumption of commercial fertilizers in the year ended June 30, 1944, was about 12,360,000 tons, containing 617,000 tons of nitrogen, 1,265,000 tons of available phosphoric acid, and 626,000 tons of potash. This is the largest consumption ever recorded, but indications are that consumption in 1945 was somewhat higher. Mixed fertilizers, 8,500,000 tons, constituted 70 percent of this total. The other 30 percent included 1,600,000 tons of superphosphate, 800,000 tons of nitrate of soda, 196,000 tons of raw rock phosphate, 162,000 tons of ammonium nitrate, and lesser quantities of more than 40 other materials.

On June 30, 1944, 675 companies, including 37 farmer-owned cooperatives, operated 978 separate factories manufacturing fertilizers. Of the total shipments, 37 percent were made by only 7 companies. About half the companies sold less than 4,000 tons each during the year 1943–44. All these small concerns together handled only 4.7 percent of the total business.

Although the United States as a whole used more fertilizer than ever before, some States consumed less than in previous years.

Georgia and South Carolina actually used less in the fiscal year 1943–44 than in the years from 1910 to 1914, when consumption was at a very much lower rate in nearly all other States.

Only 262 different grades of mixed fertilizers were sold in the fiscal year 1943–44 as compared with more than 1,000 before 1939. Thus progress is being made in the standardization of grades. The most popular grade is 2–12–6, which accounted for one-sixth of the total. The 5–10–5 grade is growing rapidly in popularity. The 3–8–5 grade, which only a few years ago was the most popular, is rapidly dropping out of the picture.

In mixed fertilizers, ammonia supplied 72 percent of the nitrogen, superphosphate 94 percent of the phosphoric acid, and muriate of potash 80 percent of the potash.

METHODS USED

Questionnaires were sent by the Fertilizer Requirements Section, Office of Materials and Facilities, War Food Administration, to all known fertilizer manufacturers in the United States. The company reports were tabulated and the results analyzed in the Division of Soils, Fertilizers, and Irrigation, of the Bureau of Plant Industry, Soils, and Agricultural Engineering. The tabulated results were compared with State reports when such were available. In this way a number of significant discrepancies between the two were discovered and investigated and appropriate corrections made. Where returns were not obtained from all companies known to have operated in a State, and a State publication gave higher tonnages of several grades than the totals obtained in this survey, the State figures were adopted. On the other hand, in a number of cases higher figures than those published by the State were obtained in this survey. It was learned in several instances that this difference was due to shipments from distant points, which apparently were unknown to authorities in the area.

The details regarding fertilizers distributed by Government agencies were obtained from official reports of the Tennessee Valley Authority and the Agricultural Adjustment Agency (*8, p. 99; 1p*).[2]

The total quantities of fertilizer materials consumed in the United States were obtained from the questionnaires, from official statistics, and other sources. The questionnaires showed only the quantities sold as such to farmers. Thus the quantities of materials used in making mixed fertilizers had to be determined from other sources of information. The data for consumption of superphosphate were derived from production and stock-on-hand figures gathered by the United States Bureau of the Census (*22p*) and from import and export figures gathered by the Foreign Trade Division of the Bureau of the Census.[3]

The totals of various nitrogenous chemicals were determined by the Nitrogen Unit of the War Production Board.[3] Information on the consumption of potash materials was obtained largely from reports of the Bureau of Mines (*39*) and the American Potash Institute (*2p*). The quantities of dolomite, phosphate rock, and peat used as fertilizer filler were estimated from figures for the calendar years 1943 and 1944, published by the Bureau of Mines (*39*). The shipments of the remaining materials were arrived at through correspondence with manufacturers and brokers. Where possible, production figures were adjusted for changes in stocks, exports, and imports.

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[2] Italic numbers in parentheses refer to Literature Cited, p. 24. The series beginning with (*1p*) refers to Processed Material, p. 26.

[3] Unpublished data.

The quantities shipped to noncontiguous Territories were provided by the Bureau of the Census in advance of publication.

The quantities of materials used to make mixed fertilizers in continental United States were determined by deducting from the total consumption the shipments to the Territories and the quantities used separately, as determined from the questionnaires. The filler is merely the difference between the sum of all known materials used and the total quantity of mixtures sold.

The consumption of nitrogen, phosphoric acid, and potash was calculated for each State. For this purpose the tonnages of the various kinds and grades of fertilizers reported in this survey were totaled for each State and these totals used in connection with the average plant-food content of each kind. The average plant-food contents were calculated from analyses given in the fertilizer-control bulletins for the following States, the only ones for which analyses were available: Alabama (*34*), Arizona (*2*), Connecticut (*4*), California (*6*), Delaware (*9, 10*), Florida (*36*), Georgia (*14*), Indiana (*33*), Kansas (*12p*), Kentucky (*38*), Louisiana (*18*), Maine (*37*), Maryland (*20, pp. 66–77; 21, pp. 82–103*), Massachusetts (*22*), Minnesota (*16*), Mississippi (*28*), Missouri (*26*), New Hampshire (*35*), New Jersey (*7*), New Mexico (*19*), New York (*30*), North Carolina (*31*), Pennsylvania (*32*), Puerto Rico (*23*), Rhode Island (*11*), South Carolina (*41*), Texas (*13*), Vermont (*40*), Virginia (*5, 17*), West Virginia (*42*), and Wisconsin (*15*). Values were estimated for the other States from those of nearby States for which figures were available. For mixed fertilizers the plant-food content was assumed to be the weighted average grade determined in the survey for the State plus the percentage of nitrogen, phosphoric acid, and potash by which the average sample analyzed exceeded the guarantee as reported in the above-cited bulletins.

Completeness of Returns

At the time this circular was written, statements of the number of tons of various fertilizers consumed in 1944 or some 12-month period ending in 1944 had been published by the following States: Alabama (*8p*), Arizona (*2*), Arkansas (*3*), California (*5p, 6p*), Connecticut (*4*), Florida (*12*), Idaho (*10p*), Iowa (*11p*), Illinois (*7p*), Indiana (*33*), Kansas (*13p*), Kentucky (*38*), Louisiana (*14p*), Maryland (*4p*), Massachusetts (*22*), Michigan (*15p*), Minnesota (*16*), Mississippi (*27*), Missouri (*16p*), New Jersey (*3p*), New Mexico (*19*), North Carolina (*17p, 18p*), Ohio (*19p, 20p*), Oklahoma (*21p*), South Carolina (*24p*), Texas (*13*), Vermont (*40*), Washington (*23p*), and Wisconsin (*9p*).

Inasmuch as only about half the States and Territories ordinarily have such data and many of these are collected on such different bases that they are not directly comparable with figures for other States, a number of surveys for all States were made by this Bureau in cooperation with other agencies. The more recent of these are for the calendar year 1941 (*25*) and for the fiscal year ended June 30, 1943 (*24*).

Practically complete details of sales to farmers were obtained in this study for 38 States, Hawaii, and the District of Columbia. The proportion of the total accounted for in the remaining States is estimated as follows: Alabama, 98 percent; Delaware, 82; Florida, 90; Georgia, 93; Maryland, 93; Oregon, 94; South Carolina, 92; Virginia, 99; Washington, 94; Wisconsin, 92; and Puerto Rico, 89. For the entire United States the returns are believed to be 97.57 percent complete.

The figures given later are adjusted to 100 percent, on the assumption that the companies that did not report sold the same grades and kinds of fertilizers as those that did report. This adjustment is made by dividing all the figures for a State by the estimated percentage of completeness and then multiplying the results bv 100.

POLICIES ADOPTED

"Plant food" and "plant nutrient" are here used as synonymous terms, as is customary in fertilizer laws and common usage. Only the three principal plant nutrients—nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O)—are included in this work. When the term "total plant-food content" is used it means the sum of these three nutrients only. The word "ton" in this circular means the short ton, 2,000 pounds.

Differences in State laws result in inconsistencies among data published by different States. The policies here adopted are generally those of the majority of the States. Thus, dried manures, gypsum, phosphate rock, manganese sulfate, and similar materials, when reported as sold by fertilizer companies in retail trade, are considered to be fertilizers. Limestone and other liming materials are not so considered, because nearly all States have separate statistics for liming materials. The tabulated results are given on the same basis for all States. For this reason the total consumption given will not check with certain figures published elsewhere for Arkansas, California, Florida, and Illinois.

All calculations were checked and the entries from the questionnaires verified.

THE INDUSTRY IN 1943–44

During the year 1943–44, 675 companies manufactured and sold fertilizers at retail. In this survey all subsidiaries operated by one organization are included with the parent company. Twelve of the 675 concerns manufactured and sold only a single material, such as calcium cyanamide or activated sewage sludge. The remaining 663 sold mixed fertilizers. Of these, 37 were farmer-owned cooperatives.

The total number of fertilizer factories in the spring of 1944 was 978. Sixty-nine companies operated more than 1 plant each. The companies were counted by classes according to the number of separate factories each owned, with the following results:

Class:	*Companies*
1 plant	606
2 plants	36
3 or 4 plants	16
5 to 9 plants	8
10 to 19 plants	4
20 to 29 plants	4
30 to 39 plants	1

Although most of the companies that reported in the present survey sold superphosphate, only 63 of them manufactured it. These 63 operated 158 plants, including 9 double superphosphate plants.

The distribution of the companies by size of shipments, exclusive of sales to other manufacturers, is given in table 1. The highest tonnage groups would have included more companies had sales to other manufacturers been included. Obviously this could not be done without duplication.

TABLE 1.—*Distribution*[1] *of fertilizer companies by size of retail shipments, year ended June 30, 1944*

Class interval (tons)	Companies	Total shipments[2]	
		Quantity	Proportion of total
	Number	*Tons*	*Percent*
Under 1,000	89	42,885	0.35
1,000–1,999	140	198,390	1.60
2,000–3,999	120	338,188	2.74
4,000–7,999	118	680,972	5.51
8,000–15,999	94	1,072,813	8.68
16,000–31,999	61	1,389,135	11.24
32,000–63,999	20	886,032	7.17
64,000–127,999	17	1,446,789	11.70
128,000–255,999	9	1,739,667	14.08
256,000 or more	7	4,564,399	36.93
Total	675	12,359,270	100.00

[1] Includes the Territories.

[2] Includes Government distribution. The shipments of 86 companies were estimated. All but 3 of these were in the first 5 classes above. The total tonnage thus estimated was 327,900, or 2.7 percent. The estimates were based largely on the rated capacities published in the 1944 American Fertilizer Hand Book (*1, sec. A*), adjusted so that the sum of those for a State balanced the difference between the total consumption and that already determined for that State.

More than one-third of the total sales were made by 7 companies, and half of the total by 16. At the other end of the scale half of the total number of concerns all together sold only 4.7 percent of the total tonnage.

The vast majority (517 of the 675, or 77 percent) sold their products in only one State. Seventy-two companies shipped into 2 States, 43 into 3 or 4, 22 into from 5 to 9, 10 into from 10 to 19, 5 into from 20 to 29, and 6 into more than 30 States.

FERTILIZER CONSUMPTION

TONNAGE, BY STATES

Consumption of all fertilizers, by States, regions, and classes, is given in table 2. The total consumption of more than 12,360,000 tons in the year ended June 30, 1944, is the largest in history. It is 7.8, 14.2, and 33.1 percent larger than the consumption in the fiscal years 1943, 1942, and 1941, respectively. Of the 1944 total, 11,490,000 tons were distributed by commercial organizations, 826,432 tons by the Agricultural Adjustment Agency, and 42,435 tons by the Tennessee Valley Authority. In addition to that distributed directly by the AAA, a large tonnage of commercially distributed material was paid for by that agency. The 1944 program of the AAA involved 2,361,857 tons of fertilizers, as compared with 2,253,337 and 1,308,672 tons, respectively, in the 1943 and 1942 programs.

Although the United States as a whole used more fertilizer in 1943–44 than in 1942–43, a number of States used less; for example, the New England States, except Massachusetts and Connecticut. Consumption increased greatly in all the Western States. It more than doubled in Idaho, Wyoming, Arizona, and Utah. A considerable part of this increase, however, was accounted for by the activities of the AAA. In Puerto Rico consumption was threefold that in 1943, but this was not new business, as shortage of shipping prevented normal deliveries there in 1942 and 1943. They returned to normal in 1944, so that the 1944 figure is about the average of the 1940 and 1941 consumption in Puerto Rico.

TABLE 2.—*Consumption of fertilizers, by States, in the form of commercial mixtures and as separate materials, in the fiscal years ended June 30, 1943 and 1944*

State and region	Commercial mixtures		Separate materials [1]		Total	
	1943 [2]	1944 [3]	1943 [2]	1944 [3]	1943 [2]	1944 [3]
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Maine	217,120	210,839	12,281	16,516	229,401	227,355
New Hampshire	19,690	15,135	9,687	9,498	29,377	24,633
Vermont	29,374	12,209	14,643	28,991	44,017	41,200
Massachusetts	65,905	66,023	23,252	29,752	89,157	95,775
Rhode Island	13,428	12,463	2,472	3,289	15,900	15,752
Connecticut	56,070	54,626	26,489	33,294	82,559	87,920
New England	401,587	371,295	88,824	121,340	490,411	492,635
New York	285,779	325,653	206,185	193,346	491,964	518,999
New Jersey	189,475	225,243	23,111	27,222	212,586	252,465
Pennsylvania	299,689	352,357	114,178	100,816	413,867	453,173
Delaware	37,195	40,919	3,448	4,077	40,643	44,996
District of Columbia	1,201	1,337	488	156	1,689	1,493
Maryland	168,216	183,052	28,287	29,412	196,503	212,464
West Virginia	38,956	41,130	58,530	23,152	97,486	64,282
Middle Atlantic	1,020,511	1,169,691	434,227	378,181	1,454,738	1,547,872
Virginia	356,645	406,559	180,534	132,157	537,179	538,716
North Carolina	1,049,067	1,135,496	281,706	278,152	1,330,773	1,413,648
South Carolina	585,218	601,043	232,268	224,798	817,486	825,841
Georgia	760,056	805,181	328,704	301,151	1,088,760	1,106,332
Florida	581,707	727,338	79,012	66,542	660,719	793,880
South Atlantic	3,332,693	3,675,617	1,102,224	1,002,800	4,434,917	4,678,417

TABLE 2.—*Consumption of fertilizers, by States, in the form of commercial mixtures and as separate materials, in the fiscal years ended June 30, 1943 and 1944*—Continued

State and region	Commercial mixtures		Separate materials [1]		Total	
	1943 [2]	1944 [3]	1943 [2]	1944 [3]	1943 [2]	1944 [3]
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Ohio	431,442	513,015	68,110	48,103	499,552	561,118
Indiana	346,572	383,663	56,954	41,329	403,526	424,992
Illinois	88,274	115,683	164,278	191,807	252,552	307,490
Michigan	211,454	238,175	55,231	43,659	266,685	281,834
Wisconsin	153,119	152,651	68,419	54,322	221,538	206,973
East North Central	1,230,861	1,403,187	412,992	379,220	1,643,853	1,782,407
Minnesota	29,700	42,878	28,058	30,843	57,758	73,721
Iowa	31,231	45,175	34,291	30,479	65,522	75,654
Missouri	36,728	57,884	109,791	105,216	146,519	163,100
North Dakota	799	1,604	2,048	1,444	2,847	3,048
South Dakota	125	96	350	220	475	316
Nebraska	793	161	1,412	1,371	2,205	1,532
Kansas	1,828	5,047	32,660	34,513	34,488	39,560
West North Central	101,204	152,845	208,610	204,086	309,814	356,931
Kentucky	96,715	142,309	255,295	147,999	352,010	290,308
Tennessee	161,196	173,237	194,683	140,054	355,879	313,291
Alabama	471,674	506,935	262,718	294,772	734,392	801,707
Mississippi	241,924	229,159	247,886	245,710	489,810	474,869
East South Central	971,509	1,051,640	960,582	828,535	1,932,091	1,880,175
Arkansas	102,793	89,631	61,253	89,333	164,046	178,964
Louisiana	122,538	124,352	78,958	93,335	201,496	217,687
Oklahoma	8,475	12,598	7,458	10,091	15,933	22,689
Texas	125,160	155,313	39,971	56,770	165,131	212,083
West South Central	358,966	381,894	187,640	249,529	546,606	631,423
Montana	486	967	4,482	6,334	4,968	7,301
Idaho	1,783	4,097	8,975	24,873	10,758	28,970
Wyoming	139	78	1,453	3,243	1,592	3,321
Colorado	2,453	1,791	5,669	8,210	8,122	10,001
New Mexico	421	457	3,645	5,003	4,066	5,460
Arizona	4,184	6,758	10,976	24,725	15,160	31,483
Utah	401	548	3,117	7,921	3,518	8,469
Nevada	75	130	125	236	200	366
Washington	28,830	22,857	20,761	33,424	49,591	56,281
Oregon	11,877	10,022	23,139	30,445	35,016	40,467
California	131,788	167,033	228,736	341,794	360,524	508,827
Western	182,437	214,738	311,078	486,208	493,515	700,946
Hawaii	42,883	42,373	51,611	48,509	94,494	90,882
Puerto Rico	61,596	176,402	3,293	21,180	64,889	197,582
Noncontiguous Territories	104,479	218,775	54,904	69,689	159,383	288,464
Continental United States	7,599,768	8,420,907	3,706,177	3,649,899	11,305,945	12,070,806
Total	7,704,247	8,639,682	3,761,081	3,719,588	11,465,328	12,359,270

[1] Includes raw rock phosphate and minor element materials, such as borax, manganese sulfate, etc. Also includes fertilizers distributed by Government agencies. Does not include liming materials.

[2] Revised.

[3] Preliminary.

SEASONAL DEMANDS

Sales of fertilizer tax tags are recorded monthly by 17 States. The proportions sold in each month of the total for the year are shown graphically in figure 1. Normally most farmers bought their fertilizers only as needed. This is shown by the 1940 curve, which is typical of prewar years. In 1943 and 1944 determined efforts were made to get the farmer to buy his fertilizer early and thus avoid the rush in the peak season in March and April. The

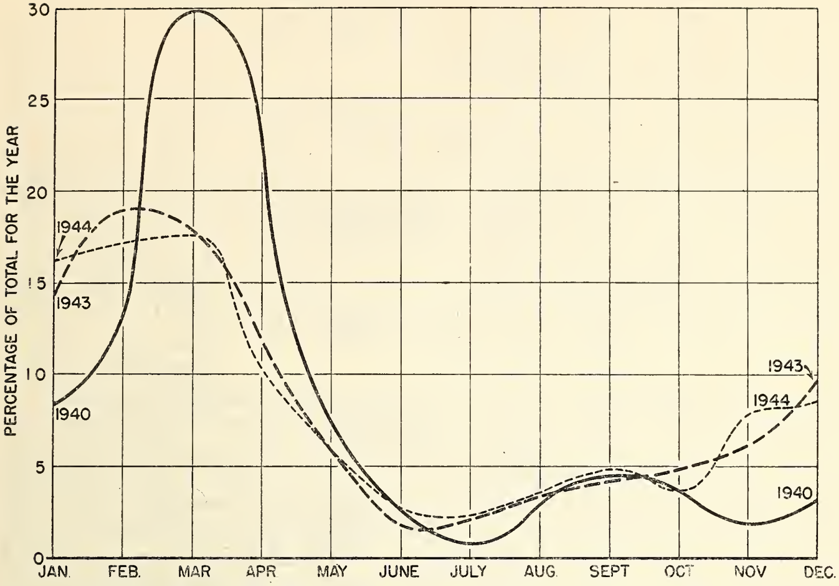

FIGURE 1.—Monthly tax-tag sales, 1940, 1943, and 1944.

curves indicate that this campaign met with fair success. On the other hand, in this survey shipments in the fall of 1943 were 21.4 percent of the total for the year ended June 30, 1944, whereas in 1941 the corresponding proportion was 20.2 percent. When taken together, these facts indicate that the shipping season was spread out in the 1943–44 fiscal year more than usual, but that very little was shipped before January 1.

TRENDS

According to the National Fertilizer Association (NFA) (*29*) total fertilizer consumption in continental United States increased from about 5,452,000 tons in 1910 to a little more than 8,000,000 tons in 1929 and 1930. It then dropped rapidly in the depression years to 4,336,000 tons in 1932 and then increased to 8,249,000 tons in 1940, 12,055,000 tons in 1944, and 13,203,000 tons in 1945.

The tonnage of fertilizers consumed in each region and the percentage of the total are shown in table 3, on a calendar-year basis for certain years, beginning with 1910. Every region used more fertilizer in 1945 than ever before, but the Atlantic Coast States consumed a much smaller proportion of the total, and the Central and Western States relatively more than formerly. The New England States used 300,950 tons in 1914, almost as many tons as in 1940, but the average plant-food content of the fertilizers consumed in recent years in these States has almost doubled, as compared with 1914 consumption. The Central and Western States have greatly increased not only their tonnage but also the plant-food content.

TABLE 3.—*Trends in fertilizer consumption,*[1] *by regions, calendar years 1910–45*

Region[2]	1910		1920		1930		1940		1944		1945	
	Consumption	Proportion of total	Consumption	Proportion of total	Consumption	Proportion of total	Consumption	Proportion of total	Consumption	Proportion of total	Consumption	Proportion of total
	1,000 tons	*Percent*	*1,000 tons*	*Percent*	*1,000 tons*	*Percent*	*1,000 tons*	*Percent*	*1,000 tons*	*Percent*	*1,000 tons*	*Percent*
New England	208	3.82	351	4.89	372	4.53	339	4.11	460	3.82	500	3.79
Middle Atlantic	853	15.64	1,017	14.18	1,086	13.22	1,205	14.61	1,529	12.68	1,571	11.90
East North Central	339	6.22	672	9.36	788	9.60	912	11.06	1,770	14.69	2,082	15.77
West North Central	34	.62	115	1.60	110	1.33	151	1.83	404	3.35	491	3.72
South Atlantic	3,146	57.70	3,999	55.73	3,857	46.97	3,501	42.44	4,692	38.92	5,038	38.16
South Central	828	15.19	942	13.13	1,812	22.07	1,825	22.12	2,585	21.44	2,814	21.31
Western	44	.81	80	1.11	187	2.28	316	3.83	615	5.10	707	5.35
Continental United States	5,452	100.00	7,176	100.00	8,212	100.00	8,249	100.00	12,055	100.00	13,203	100.00

[1] Includes Government distribution. Data from NFA annual publication (*29*).

[2] For the States included in each region, see table 2.

On the other hand, South Carolina and Georgia alone used about one-third of all the fertilizer consumed in the United States in most years before 1920, but in recent years they have used only about one-sixth of the total, and this contained only a little more plant food on the average than it did 40 years ago. (For a further discussion of these trends see Plant Nutrients, p. 21.) In 1910 South Carolina and Georgia consumed 975,039 and 1,022,048 tons, respectively, of commercial fertilizers. The sum of these two figures, 1,997,087 tons, is 36.6 percent of the total consumption for the entire continental United States. In the calendar years 1944 and 1945, according to the National Fertilizer Association figures (*29*), these two States consumed 1,891,746 tons and 1,961,570 tons, respectively, or less than in 1910. A part of the 1945 tonnage, which is only 14.9 percent of the United States total, was distributed by the Government.

In sharp contrast with this decline, however, consumption in all the adjoining States increased from 1910 to 1945. The increases were as follows: North Carolina, from 630,909 to 1,530,276 tons; Florida, from 172,641 to 917,316; Tennessee, from 58,612 to 374,961; and Alabama, from 425,000 to 780,871. In fact, during this period, fertilizer consumption increased very greatly in nearly all States except South Carolina and Georgia. For example, consumption in Illinois increased from 5,000 tons to 270,243; in Wisconsin, from 2,000 to 268,243; in Idaho, from none to 34,086 tons; in Washington, from 1,000 to 62,449; in Oregon, from 2,500 to 45,234; and in California, from 41,000 to 487,701—to mention a few of the most striking cases. This trend is shown graphically in figure 2.

PRINCIPAL GRADES OF MIXED FERTILIZERS

The consumption of mixed fertilizers for the entire United States in the year ended June 30, 1944, was 8,639,682 tons, or 69.9 percent of the total consumption of all fertilizers (table 2), as compared with 63 percent in 1941, 71 percent in 1938–39, and 74 percent in 1933–34.

During 1942 and 1943 various governmental orders limited the number of grades of mixed fertilizers that might be sold in each State to a specified list of permitted grades. The chief of these was Conservation Order M–231, issued by the War Production Board, effective December 4, 1942. This was superseded on January 18, 1943, by Food Production Order 5, issued by the War Food Administration.

The total number of permitted grades in 1943–44 was 137. Of these, 92 were complete mixtures; 19, P–K mixtures; 18, N–P mixtures; 6, N–K mixtures; and 2, one-primary-element[4] mixtures. In addition, grades already made up before the orders went into effect could be sold until the stocks on hand were exhausted. In the 1934, 1939, 1941, and 1943 surveys (*24, 25*) the total numbers of separate grades of mixed fertilizers reported were 1,053, 982, 651, and 594, respectively. None of these surveys was complete. The total

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[4] For example, 0–16–0 plus MnO.

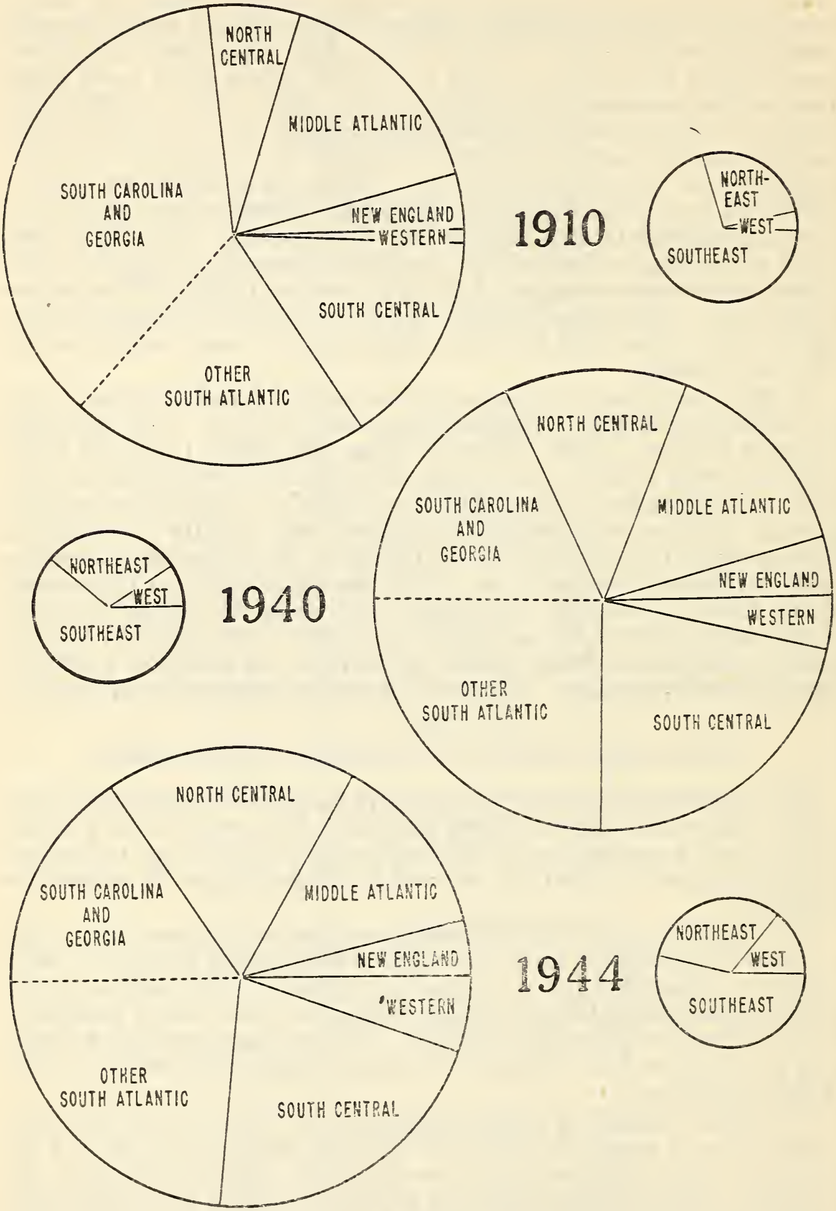

FIGURE 2.—Fertilizer consumption by regions, 1910, 1940, and 1944. In the small charts Northeast includes New England, Middle Atlantic, and East North Central States; Southeast includes South Atlantic and East South Central States; West includes the States west of the Mississippi River. The large charts show subdivisions.

number reported in 1944 was 262, and this was practically complete. This indicates progress in the standardization of grades.

The 2–12–6 grade accounted for approximately one-sixth of the entire tonnage in 1944. Sales in 27 States totaled 1,390,000 tons. In 1942–43 the sales of this grade were 826,000 tons. This grade was No. 28 in size of tonnage in the 1925 survey, and its relative importance has increased steadily ever since. There is a strong probability, however, that it has reached its peak, because the agricultural leaders of several States have shifted their recommendations from 2–12–6 to 4–12–8.

The 3–9–6 grade, although still standing second, has declined in importance since the year 1942–43. The total tonnage was 737,000 in 1943–44, as compared with a 95-percent complete figure of 792,000 in 1942–43. This grade accounted for 8.76 percent of the total this year and 11.08 percent for the previous year. It stood No. 212 in 1941 with only 761 tons reported.

The third most popular grade in 1944 was 5–10–5, with 515,000 tons and 6.12 percent of the total. This grade ranked No. 24 in the 1943 list and No. 143 in 1925. Its rapid rise is due to the fact that 4–8–4 fertilizer has been eliminated and 5–10–5 has been substituted for 3–8–7 as the victory-garden fertilizer in those sections where most of the garden fertilizer is used. Shipments of this grade during the 1944 season, however, exceeded the combined shipments of 4–8–4, 3–8–7, and 5–10–5 in 1943 by about 10,000 tons.

Other grades that have increased in importance are 6–8–4, 4–10–6, 4–10–4, 4–12–4, 5–10–10, 3–12–12, and 6–8–6. The outstanding example in this group is the 5–10–10 grade. Shipments in 1944 of 189,000 tons placed this grade twelfth in the list. In 1943 only 10,806 tons were reported.

An important grade that went down is the 3–8–5, which stood first in tonnage sold in 1939 and now stands tenth. The indications are good that this grade, which has become uneconomical, will disappear completely from the market in the near future just as the 2–8–2, 3–8–3, and 4–8–4 already have. For many years these latter three grades stood either first, second, or third in order of tonnage sold.

The 0–14–7 grade, which was No. 3 in 1943, now stands No. 11. It was, however, only No. 244 in 1941. The popularity of 0–14–7 in 1943 was due to the grade substitution program to save nitrogen. It was sold widely to farmers who normally would have bought 2–12–6 had it been available. The 0–14–7 has supplanted the 0–14–6, 0–12–6, and 0–10–6, and thus is expected to continue to sell better than previous to the substitution program.

Although the 3–12–6 grade dropped from fourth place in 1943 to ninth in 1944, the tonnage shipped was only slightly less. This grade had been climbing steadily until suddenly boosted by the grade substitution program that went into effect on January 18, 1943. Its purpose was to conserve nitrogen and to require farmers to use certain lower nitrogen ratios than previously in the grades of mixed fertilizers bought. Under this program the 3–12–6 was one of the grades that could be substituted in many States for former grades containing 4 percent nitrogen. It is believed that the 3–12–6 grade will continue to increase in importance, at least in the near future.

In the 1944 fiscal year 63.57 percent of the total shipments were accounted for by 10 grades, 86.96 percent by 25, and 94.85 percent by 50. The corresponding percentages were 59.66, 83.42, and 93.72 in 1943, and 50.18, 71.90, and 83.41 percent in 1934. In 1944, 95 percent of the tonnage was accounted for by 51 grades. Ten years earlier it required the combined tonnages of 172 grades to make 95 percent of the total.

Only 2 grades, the 4–12–4 and 5–10–5, were sold in as many as 30 States 10 years ago. In 1944 there were 5 such grades, the 5–10–5, 4–12–4, 0–14–7, 6–10–4, and 3–8–7. These facts also indicate progress in standardization.

The 10 principal grades shipped in each region during the current fertilizer year are listed in table 4. Of the 10 grades listed for New England only 3 were present in a similar tabulation for the previous fiscal year—6–9–15, 3–12–6, and 6–3–6. Of those in the 1943 list only 1, the 6–3–6, was in a similar list for 1941, and none was present on the 1939 list. Thus the kind of grades in use in New England has changed rapidly. Of the 10 chief grades in New England in 1944, only 1 contained less than 20 units of total plant food. This is the 6–3–6, a special fertilizer with high insoluble nitrogen for shade-grown tobacco. The 5–10–10, which was ninth in 1941, is now fifth. It increased in tonnage from 3,675 in 1939 to 56,424 in 1944. Three double-strength grades—8–16–20, 8–16–16, and 8–16–14—which were popular in 1941, do not appear in later lists. This is because of the scarcity of the double superphosphate that must be used to make such grades and not because of unwillingness of the farmer to buy them.

The No. 1 grade at present in the Middle Atlantic region is 5–10–5, with 213,595 tons. In 1942–43 the 4–10–5 grade, which had been temporarily substituted for 5–10–5, was second, with 113,333 tons. The 2–12–6 fertilizer, which was first in 1941, moved back to third place, and the 3–12–6 moved up from third place in 1941 to second in 1944. The tonnage of the 5–10–10 grade increased in the Middle Atlantic region from 12,003 in 1938–39 to 115,484 in 1944.

In the South Atlantic region the 3–9–6 remained first, but the proportion of the total of all mixed fertilizers decreased from 23 to 18 percent. The 3–8–5 grade dropped from first place in 1941 to second in 1943, and to fourth in 1944. The 4–8–6, which was fifth in 1943, has moved into second place. The 5–10–5 replaces the former 4–8–4 as a grade with the 1–2–1 ratio and, although practically a new grade in this region, it represented 4.56 percent of the total, as compared with 3.92 percent for the 4–8–4 in the previous year. Both 2–12–6 and 3–12–6 were among the first 10 grades in this region in 1943 and 1944, but the relative position of the 3–12–6 increased from 2.75 percent of the total to 3.40, and that of the 2–12–6 decreased from 10.48 to 6.20.

In the North Central region 2–12–6 has long been the outstanding grade of mixed fertilizer and it still is. Its tonnage increased

TABLE 4.—*Consumption of principal grades of mixed fertilizers in the United States and its regions, year ended June 30, 1944*

Region and grade (N–P_2O_5–K_2O)	Consumption	Proportion of regional total	Region and grade (N–P_2O_5–K_2O)	Consumption	Proportion of regional total	Principal grades in the United States	Consumption	Proportion of United States total
New England	*Tons*	*Percent*	*North Central*	*Tons*	*Percent*		*Tons*	*Percent*
5–7–10	63,908	17.21	2–12–6	899,806	57.83	2–12–6	1,390,277	16.51
5–10–10	56,424	15.20	3–12–12	167,532	10.77	3–9–6	737,306	8.76
5–8–7	48,494	13.06	0–12–12	128,148	8.24	5–10–5	515,308	6.12
6–9–15	39,744	10.70	0–14–7	108,620	6.98	6–8–4	475,133	5.64
8–12–16	37,219	10.02	4–10–6	52,181	3.35	4–10–6	450,062	5.34
6–9–12	22,750	6.13	3–9–18	30,333	1.95	4–10–4	403,524	4.79
6–3–6	22,153	5.97	0–10–20	29,314	1.88	4–8–6	376,019	4.47
5–10–5	20,601	5.55	4–12–4	25,393	1.63	4–12–4	375,436	4.46
3–12–6	14,398	3.88	3–18–9	19,521	1.25	3–12–6	348,080	4.13
7–7–7	8,286	2.23	0–9–27	14,375	.92	3–8–5	282,063	3.35
10 grades	333,977	89.95	10 grades	1,475,223	94.80	0–14–7	207,311	2.46
						5–10–10	188,798	2.24
						3–12–12	169,331	2.01
						4–8–8	165,494	1.97
Middle Atlantic			*South Central*			2–10–6	160,814	1.91
5–10–5	213,595	18.26	6–8–4	435,680	30.39	0–12–12	142,888	1.70
3–12–6	203,388	17.39	4–10–6	207,488	14.47	4–12–8	139,461	1.66
2–12–6	187,016	15.99	4–12–4	178,409	12.45	5–7–5	132,796	1.58
4–12–8	129,946	11.11	5–10–5	112,022	7.81	6–8–6	130,801	1.55
5–10–10	115,484	9.87	3–9–6	82,902	5.78	4–7–5	124,443	1.48
4–12–4	84,811	7.25	4–10–4	82,242	5.74	4–6–8	96,604	1.15
4–8–12	69,878	5.97	4–8–8	80,223	5.60	5–8–7	87,025	1.03
5–8–7	38,487	3.29	2–12–6	75,623	5.28	4–8–12	81,121	.96
0–14–7	37,895	3.24	0–14–4	25,730	1.79	4–9–3	75,855	.90
3–9–12	26,438	2.26	0–14–7	23,578	1.64	3–9–9	66,410	.79
10 grades	1,106,938	94.63	10 grades	1,303,897	90.95	5–7–10	63,908	.76
						3–9–18	42,765	.51
						3–8–8	42,577	.51
South Atlantic			*Western*			6–9–15	39,744	.47
3–9–6	653,983	17.79	8–8–4	29,790	13.87	8–12–16	37,219	.44
4–8–6	392,189	10.67	6–10–4	28,414	13.23	6–10–4	34,675	.41
4–10–4	321,297	8.74	10–10–5	18,362	8.55	0–10–20	30,657	.36
3–8–5	304,303	8.28	6–9–6	18,126	8.44	3–9–12	30,589	.36
2–12–6	227,878	6.20	4–12–4	9,537	4.44	8–8–4	29,790	.35
4–10–6	190,146	5.17	17–7–0	9,036	4.21	0–14–14	25,785	.31
5–10–5	167,697	4.56	3–10–10	7,444	3.47	10–6–4	22,825	.27
2–10–6	160,814	4.38	4–10–10	6,072	2.83	36 grades	7,722,894	91.71
5–7–5	136,139	3.70	10–20–0	5,256	2.45			
3–12–6	124,770	3.40	10–10–0	4,759	2.22			
10 grades	2,679,216	72.89	10 grades	136,796	63.71			

from 352,389 in 1943 to 899,806 in 1944, and this fact alone makes it the principal grade for the entire United States. The shipments of 3–12–12 increased from 89,826 tons in 1943 to 167,532 in 1944. This was sufficient to move it from fourth to second place. The 0–14–7 dropped from second to fourth place in the same time, but the 0–12–12 retained its place as third on the list. The multiple-strength 3–18–9, which is 1½ times as concentrated as the 2–12–6, appears for the first time in 1944 among the first 10 grades.

In the South Central States the 6–8–4 has been climbing rapidly in popularity for some years and is now the most popular grade in this region and accounts for nearly a third of all the mixed fertilizers sold in these States. In 1943 the 4–10–7 represented 24.29 percent of the total, and in 1944 the 4–10–6, which was substituted for it, accounted for only 14.47 percent. The 4–12–4 has moved up from ninth place, with 5.19 percent of the total, to third place, with 12.45 percent. The 3–12–6 has declined considerably in importance in this region.

The changes in the Western region are less striking than in others. The greatest change is that of 6–10–4, which moved from seventh place, with 7,223 tons in 1942–43, to second, with 28,414 tons in 1944.

TABLE 5.—*Fertilizer materials, according to use, consumed in continental United States and the Territories, year ended June 30, 1944*

Material	Continental United States			Noncontiguous Territories	Grand total
	Mixed	As such	Total		
	Tons	*Tons*	*Tons*	*Tons*	*Tons*
Normal superphosphate[1]	4,292,000	1,578,000	5,870,000	59,000	5,929,000
Nitrate of soda[2]	12,000	824,000	836,000	7,000	843,000
Muriate of potash	756,000	40,000	796,000	35,000	831,000
Sulfate of ammonia	576,000	139,000	715,000	115,000	830,000
Dolomite and limestone[3]	445,000		445,000		445,000
Ammonia and solutions	322,000	15,000	337,000	3,500	340,500
Ammonium nitrate[4]	90,000	162,000	252,000	37,000	289,000
Manure salts	214,000	26,000	240,000		240,000
Rock phosphate	28,000	196,290	224,290	10	224,300
Gypsum[5]	80,000	138,000	218,000		218,000
Double superphosphate[6]	58,500	81,000	139,500	10	139,510
Sulfate of potash and of potash-magnesia	114,400	7,400	121,800	4,200	126,000
Process tankage	108,200	800	109,000		109,000
Tobacco stems	97,000	1,000	98,000		98,000
Basic slag[7]		91,000	91,000		91,000
Sewage sludge, activated	71,000	20,000	91,000		91,000
Cyanamid	9,000	81,000	90,000		90,000
Castor pomace	82,000	5,000	87,000		87,000
Wet-mixed base goods	68,000		68,000		68,000
Dried animal manures	20,000	42,000	62,000		62,000
Ammonium phosphate, 16–20	19,100	28,900	48,000	7,000	55,000
Cottonseed meal[8]	35,000	18,000	53,000		53,000
Sewage sludge, other[9]	20,000	21,000	41,000		41,000
Peat[10]	36,500		36,500		36,500
Peanut-hull meal	30,000		30,000		30,000
Ammonium phosphate, 11–48	10,200	5,400	15,600	6,400	22,000
Nitrate of soda-potash	600	13,900	14,500	4,800	19,300
Garbage tankage	13,800	200	14,000		14,000
Manganese sulfate	13,000	1,000	14,000		14,000
Cocoa byproducts	12,000		12,000		12,000
Bonemeal	1,000	10,000	11,000		11,000
Tung meal	3,000	2,000	5,000		5,000
Dried fish scrap	2,000	2,700	4,700		4,700
Guanos	2,000	200	2,200		2,200
Acidulated fish	2,000		2,000		2,000
Miscellaneous chemical nitrogen[11]	20,000	49,000	69,000	100	69,100
Miscellaneous organics[12]	7,000	9,000	16,000	5,100	21,100
Miscellaneous phosphates[13]	28,000	3,600	31,600		31,600
Miscellaneous potash materials[14]	20,000	7,000	27,000		27,000
Miscellaneous materials[15]	16,000	32,000	48,000		48,000
Sand and other filler	711,000		711,000	4,200	715,200
Total	8,445,300	3,651,390	12,096,690	288,320	12,385,010

[1] Grades containing 18 to 22 percent available P_2O_5. Includes 712,073 tons distributed by AAA.

[2] Includes Chilean, synthetic, and byproduct nitrate of soda.

[3] Used as fertilizer filler. In addition, more than 20,000,000 tons were consumed in agriculture as a soil amendment.

[4] Includes 9,453 tons used in TVA demonstrations.

[5] As reported by the fertilizer industry. About 200,000 tons more were sold for use in agriculture by other industries.

[6] In addition, about 44,000 tons were used in converting run-of-pile superphosphate into 20 percent material; 30,926 tons used in TVA test demonstrations are included.

[7] Including 64,165 tons distributed by AAA.

[8] Approximately 41,580 tons additional were used as fertilizer on cotton farms.

[9] Additional quantities were disposed of by city sewage disposal plants.

[10] In addition, 39,500 tons were used as a soil amendment.

[11] Ammonium nitrate-limestone mixtures, urea.

[12] Hoof-and-horn meal, dried blood, various seed meals, animal tankage, etc.

[13] Ammoniated superphosphate, basic lime phosphate, base goods, calcined phosphate rock, phosphoric acid, precipitated bone, and spent bone black.

[14] Cement-mill dust, wood ashes, cotton-hull ashes, etc.

[15] Copper sulfate, zinc sulfate, borax, magnesium oxide, sulfur, etc.

FERTILIZER MATERIALS

The quantities of the various materials used in the 1944 fiscal year to supply plant food to agriculture in the form of commercial fertilizers are given in table 5. The data in this table were derived from sources different from those in the preceding tables, as explained in the section on Methods Used. The total consumption shown by this table is 12,385,010, as compared with 12,359,270 tons in the others.

By comparing table 5 with a similar one for 1941 in Circular 689 (*25, table 6, p. 15*), it will be seen that the consumption of materials in making mixed fertilizers increased much more than that of materials used separately. The consumption of materials in the Territories was almost the same in both years, namely, 276,700 tons in 1941 and 288,320 in 1944. The use of separate materials in the continental United States was 3,459,329 and 3,651,390 tons in the 2 years, when limestone is left out of the 1941 figure to make it comparable with the present data. On the other hand the consumption of materials to make mixed fertilizers increased from 5,797,297 tons in 1941 to 8,445,300 in 1944. Thus a much smaller proportion of the materials was used for separate application in 1944 than in 1941. This is due principally to the relatively smaller part of the total consumption of separate materials represented by AAA superphosphate in 1944.

MATERIALS USED IN MIXTURES

The materials used to make commercial-mixed fertilizers underwent considerable changes in 1943–44 as compared with earlier years. The kinds of materials used as sources of plant food are shown by classes for a series of years in table 6.

TABLE 6.—*Sources of plant food in commercially mixed fertilizers, 1900–44*

Year	Nitrogen (percentage of total N)				Phosphoric acid (percentage of total P_2O_5)			Potash (percentage of total K_2O)		
	Ammonia[1]	Nitrates[1]	Natural organics	Organic chemicals	Normal superphosphates	Concentrated phosphates[2]	All other	High-grade salts[3]	Kainit and manure salts	All other[4]
1900	2.1	6.9	91.0	------	79.8	------	20.2	71.3	19.6	9.1
1909	16.1	16.2	67.7	------	80.1	------	19.9	47.9	44.6	7.5
1913	24.0	19.6	54.3	2.1	78.7	------	21.3	51.2	39.5	9.3
1919	23.8	19.7	53.6	2.9	81.9	1.7	16.4	54.6	7.8	37.6
1925	29.5	23.1	37.0	10.4	87.7	5.2	7.1	52.6	40.1	7.3
1929	48.2	19.0	22.2	10.6	87.4	5.1	7.5	54.3	38.5	7.2
1935	53.0	18.3	21.9	6.8	86.6	7.5	5.9	77.5	6.1	16.4
1939	58.2	15.6	15.3	10.9	85.4	10.0	4.6	90.8	3.3	5.9
1941	59.0	11.5	15.8	13.7	87.5	9.1	3.4	91.5	6.0	2.5
1944	72.0	13.1	8.3	6.6	93.6	4.0	2.4	88.1	9.4	2.5

[1] Half of the nitrogen of ammonium nitrate is assigned to ammonia and half to nitrates.
[2] Double superphosphate and ammonium phosphate.
[3] Includes muriate, sulfate, and nitrate, but not carbonate, which is included with "All other."
[4] Cement dust, tobacco stems, ashes, etc.

In 1900, 2 percent of the nitrogen in mixed fertilizer was in the ammonia form, derived at that time from ammonium sulfate. By 1944 this form had increased until 72 percent was from ammonia—derived from ammonium sulfate, ammonium phosphate, anhydrous ammonia, ammonia liquors, and ammonium nitrate. Ammonium nitrate only recently was added to this class of materials, but 90,000 tons were used in the year ended June 30, 1944. As late as 1925 almost as much nitrogen in mixed fertilizers came from sodium nitrate as from ammonium compounds, but in 1944 only 1,920 tons of nitrogen came from nitrate of soda out of a total of 313,193 tons of total nitrogen. Most of the nitrate nitrogen in mixed fertilizers is now from ammonium nitrate. The proportion of natural organic nitrogen has been going down steadily—in 1944 it was only about half what it was just before the war.

Since the beginning of World War II a large part of the double superphosphate production had been diverted to lend-lease shipments to save boat space in crossing the Atlantic, and production was curtailed so as to have phosphorus for making incendiary bombs. Thus the quantity available to make mixed fertilizers had been greatly reduced. The quantity obtained from bonemeal and other organics also was restricted, owing to diversion into the manufacture of feed. Consequently, 93.6 percent of the P_2O_5 in mixed fertilizers came from one source, namely, ordinary superphosphate.

Superphosphate

Superphosphate has long been the principal fertilizer material, both for making mixed fertilizers and for use as a separate application. The present season's consumption of normal superphosphate (18- to 20-percent P_2O_5) was 5,929,000 tons. This is larger than the sum of the tonnages of all the 40 or more other materials used to supply plant food. One percent of the superphosphate was consumed in the island Territories, chiefly in making mixed fertilizers; 72 percent was used in making mixed fertilizers in continental United States; and 27 percent was used in direct application or for home mixing. The Agricultural Adjustment Agency directly distributed 712,000 tons and indirectly accounted for a large additional tonnage sold through the regular channels of commerce, particularly in New York, where about 70,000 tons was bought by farmers with AAA purchase orders.

The principal features of the United States position regarding various superphosphates are summarized in table 7.

Other Materials

The total consumption of ammonium sulfate as fertilizer in the calendar year 1944 was 905,000 tons, as compared with 834,262 tons in 1943, 830,118 in 1942, 748,377 in 1941, and a 5-year average of 649,174 in the prewar years, 1936 to 1940, inclusive. In the year ended June 30, 1944, in continental United States 139,000 tons was used as a separate material and 576,000 tons as an ingredient of mixed fertilizers. An additional 115,000 tons was consumed in

TABLE 7.—*Balance between the production and consumption of superphosphates and their P_2O_5 content, year ended June 30, 1944*

Item	Normal superphosphate		Wet-mixed base goods		Double superphosphate		Available P_2O_5 content
	P_2O_5 basis	Tonnage	P_2O_5 basis	Tonnage	P_2O_5 basis	Tonnage	
	Percent	*Tons*	*Percent*	*Tons*	*Percent*	*Tons*	*Tons*
Stocks on hand, July 1, 1943[1]	18.0	605,863	18.0	3,867	45.0	50,344	132,406
Production[1]	18.0	6,766,178	18.0	54,629	45.0	290,059	1,358,272
Imports[2]	20.0	740	------	------	45.0	6	151
Exports[2]	20.0	170,064	------	------	47.5	118,900	90,491
Stocks on hand, June 30, 1944[1]	18.0	759,131	18.0	3,001	45.0	43,957	156,965
Apparent consumption:							
Census Bureau basis	18.0	6,424,772	18.0	55,495	45.0	170,947	1,243,373
Actual average grade	19.38	5,967,275	14.5	68,890	46.1	166,868	1,243,373
Consumption,[3] continental United States:							
Government distribution	20.3	712,073	------	------	47.0	30,926	159,086
Commercial distribution	20.1	865,709	------	------	44.1	33,625	188,836
In making mixed fertilizers	19.1	4,292,000	14.5	68,000	46.5	58,500	856,834
Consumption,[3] Hawaii and Puerto Rico	19.5	59,083	------	------	45.0	12	11,290
Consumption,[3] in making 20 percent superphosphate	------	------	------	------	46.5	44,288	20,594
Consumption,[2] in making defluorinated phosphate for feed	18.0	41,903	------	------	------	------	7,542
Total consumption as determined	19.38	5,970,768	14.5	68,000	46.1	167,351	1,244,182
Less correction[4]	------	------	------	------	------	------	28,136
Consumption as fertilizer	------	------	------	------	------	------	1,216,411
Difference between total as determined and apparent consumption	19.38	+3,493	14.5	—890	46.1	+483	+809

[1] U. S. Bureau of the Census (*22p*).
[2] U. S. Bureau of the Census unpublished preliminary figures.
[3] As determined or estimated in this survey.
[4] For duplication involved in double superphosphate used to make 20-percent superphosphate from run-of-pile material and for superphosphate used to make defluorinated phosphate.

Hawaii and Puerto Rico. In the calendar year 1941 the corresponding figures were 177,000, 354,000, and 139,000 tons, respectively. California used 74,214 tons as a separate material in the 1944 fiscal year, as compared with only 59,031 in the calendar year 1941. Thus in nearly all other States ammonium sulfate was largely diverted to making mixed fertilizers in 1944.

Ammonium nitrate has been used as a fertilizer in a solution of ammonia under the trade name Nitrogen Solution, and mixed with large proportions of limestone, under various trade names, such as Cal-Nitro and A–N–L. Relatively pure solid ammonium nitrate is a new fertilizer material developed since the beginning of the war. The total consumption in the fiscal year 1943–44 was 289,000 tons, of which 162,000 tons was used as a separate material in continental United States. Of this quantity 94,000 tons was shipped into the South Central region and 32,000 into the Western States, largely into California. As a separate application, Michigan used 4,432 tons; Wisconsin, 4,046; New York, 2,996; and Georgia, 2,017. Nearly all States used some, but the quantities were relatively small in most of the Atlantic Coast States. The above figures include 9,453 tons distributed by the Tennessee Valley Authority in its test-demonstration program.

The total consumption of sodium nitrate has fluctuated in recent years, mostly because of difficulties of importation from Chile and diversion of domestic synthetic ammonia from the manufacture of sodium nitrate to that of munitions. Total consumption was 843,000 tons in the fiscal year 1943–44, as compared with 1,024,383 tons in 1942–43 and 649,743 tons in 1941–42. In 1941–42, 98,000 tons was used in making mixed fertilizers. This increased to 213,519 tons in 1942–43, but, because of allocations, decreased to 12,000 tons in 1943–44. During this period the War Production Board regularly permitted sodium nitrate to be used in mixed fertilizers only in the area west of the Rocky Mountains. The use of an occasional small lot of byproduct material, however, was permitted in mixing in other parts of the country when the supply exceeded the immediate demand for direct application, inasmuch as storage facilities were limited.

TABLE 8.—*Consumption of plant food, by States, year ended June 30, 1944*

State and region	In mixed fertilizers			In all fertilizers[1]		
	Nitrogen	Phosphoric acid	Potash	Nitrogen	Phosphoric acid	Potash
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Maine	12,798	20,451	27,177	13,521	23,196	27,237
New Hampshire	819	1,630	1,509	1,111	3,231	1,450
Vermont	623	1,410	1,065	794	7,167	1,182
Massachusetts	3,559	6,054	5,302	4,647	8,949	5,821
Rhode Island	634	1,266	1,098	729	1,793	1,135
Connecticut	2,933	4,507	4,031	4,495	7,697	5,439
New England	21,366	35,318	40,182	25.297	52,033	42,264
New York	14,752	36,603	24,261	18,981	71,040	25,045
New Jersey	9,663	24,461	18,515	10,892	27,668	19,724
Pennsylvania	11,804	43,904	24,595	12,794	63,022	24,770
Delaware	1,232	4,828	3,441	1,498	5,332	3,486
District of Columbia	61	146	75	64	182	76
Maryland	5,931	21,014	13,527	6,721	25,999	13,654
West Virginia	1,435	5,047	2.546	1.698	9,486	2,558
Middle Atlantic	44,878	136,003	86,960	52,648	202,729	89,313
Virginia	13,254	43,055	24,515	19,256	61,864	24,772
North Carolina	38,948	105,374	66,199	68,701	117,363	70,999
South Carolina	22,118	58,001	34,560	50,098	64,432	42,043
Georgia	30,355	75,204	46,700	57,655	99,836	49,991
Florida	30,112	54,041	49,168	34,434	57,843	53,231
South Atlantic	134,787	335.675	221,142	230,144	401,338	241,036
Ohio	11,132	65,153	37,194	12,688	73,291	37,343
Indiana	6,599	47,958	35,834	8,078	52,961	36,128
Illinois	2,256	14,171	10,504	3,124	23,437	10,871
Michigan	5,621	30,248	20,293	7,643	37,030	20,380
Wisconsin	3,328	19,997	14,334	4,897	29,222	15,032
East North Central	28,936	177.527	118.159	36,430	215,941	119,754
Minnesota	1,051	5,484	4,193	1,201	12.176	4,216
Iowa	795	5,751	3,808	1,021	11,299	3,892
Missouri	1,366	7,212	4,405	1,534	28,257	4,633
North Dakota	23	257	162	23	650	162
South Dakota	1	13	6	1	76	6
Nebraska	5	24	8	6	605	8
Kansas	132	634	322	142	8,015	324
West North Central	3,373	19,375	12,904	3,928	61,078	13,241

TABLE 8.—*Consumption of plant food, by States, year ended June 30, 1944* —Continued

State and region	In mixed fertilizers			In all fertilizers [1]		
	Nitrogen	Phosphoric acid	Potash	Nitrogen	Phosphoric acid	Potash
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Kentucky	4,540	16,067	8,724	6,335	43,346	8,798
Tennessee	5,145	19,160	10,238	10,139	42,470	11,057
Alabama	23,623	48,159	26,310	45,502	77,174	27,518
Mississippi	12,283	20,326	12,054	52,610	30,914	13,620
Arkansas	4,033	9,402	6,875	12,909	17,473	9,219
Louisiana	5,832	13,716	5,745	18,573	18,708	6,529
Oklahoma	532	1,465	603	630	2,845	609
Texas	7,129	16,448	6,678	12,378	23,899	6,826
South Central	63,117	144,743	77,227	159,076	256,829	84,176
Montana	71	263	1	74	3,024	3
Idaho	305	986	66	866	6,493	197
Wyoming	7	18	2	9	878	2
Colorado	149	388	47	776	2,835	52
New Mexico	20	56	21	23	1,652	21
Arizona	568	1,104	153	2,881	2,925	362
Utah	28	92	16	197	2,306	20
Nevada	13	18	5	17	113	5
Washington	1,366	2,446	1,515	4,858	7,109	1,904
Oregon	596	1,120	676	3,030	5,054	1,011
California	13,279	15,818	8,184	59,462	27,607	10,010
Western	16,402	22,309	10,686	72,193	59,946	13,587
Continental United States	312,859	870,950	567,260	579,716	1,249,994	603,371
Hawaii	5,030	3,674	6,682	14,050	5,298	8,461
Puerto Rico	16,846	10,231	14,570	23,216	10,235	14,582
Territories	21,876	13,905	21,252	37,266	15,533	23,043
Total, 1943–44	334,735	884,855	588,512	616,982	1,265,477	626,414
1942–43 [2]	236,618	793,225	569,766	439,772	1,270,936	634,611
1938–39 [2]	202,812	505,707	336,001	384,424	781,541	399,048
1933–34 [2]	152,070	383,960	220,868	270,000	515,000	260,100
1923–24	112,000	420,000	183,000	250,000	625,000	257,000
1913–14	92,000	408,000	159,000	214,000	660,000	240,000

[1] Includes Government distribution.
[2] Revised.

PLANT NUTRIENTS

Two and one-half million tons of commercial plant food were consumed in United States agriculture in the year ended June 30, 1944. This consisted of 617,000 tons of nitrogen, 1,265,000 of phosphoric acid, and 626,000 of potash. The tonnages consumed in each State are given in table 8. The consumption for the entire country in a series of earlier years is shown at the bottom of the same table. The 1944 figures for total consumption of N, P_2O_5, and K_2O are 60, 62, and 57 percent larger, respectively, than those for 1939, and 141, 151, and 144 percent larger than for 1934. Although 177,000 tons more nitrogen was used as fertilizer in the 1944 season than in the previous year, slightly less of both phosphoric acid and potash was used in the more recent year. The consumption of nitrogen and potash is now nearly three times what it was 30 years ago and that of phosphoric acid has about doubled.

The increases in plant-food consumption in the past 30 years were far from uniform throughout the country, as may be seen in table 9. The necessary data to calculate the figures fairly accurately for years before 1925 are available only for the States shown. California used almost 20 times as much plant food in 1944 as in 1914, but Georgia used less. As mentioned in the section on Trends in the discussion of Fertilizer Consumption, South Carolina also used less in 1944 than in certain years before World War I, but this is not true of any other State. Most other States used much more: New Jersey more than twice as much, Maine 3 times, and Texas and Indiana more than 4 times as much as 30 years ago. The country as a whole consumed more than twice as much.

TABLE 9.—*Plant-food consumption in selected States and the United States, fiscal years ended June 30, 1914, 1934, and 1944*

State and year	Fertilizer	Nitrogen	Phosphoric acid	Potash	Plant food
California:	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
1914	34,400	2,072	2,190	715	4,977
1934	159.530	17,602	10,906	4,016	32,524
1944	508,827	59,462	27,607	10,010	97,079
Georgia:					
1914	1,430,379	34,733	126,550	50,184	211,467
1934	562,651	23,597	46,257	21,046	90,900
1944	1,106,332	57,655	99,836	49,991	207,482
Indiana:					
1914	219,139	1,824	19,869	1,982	23,675
1934	131,881	2,214	17,546	9,116	28,876
1944	424,992	8,078	52,961	36,128	97,167
Maine:					
1914	128,600	3,344	10,031	7,716	21,091
1934	150,000	8,025	14,116	16,949	39,090
1944	227,355	13,521	23,196	27,237	63,954
New Jersey:					
1914	155,414	3,830	13,002	9,815	26,647
1934	130,000	5,870	11,300	8,730	25,900
1944	252,465	10,892	27,668	19,724	58,284
Texas:					
1914	77,400	1,471	7,601	1,695	10,767
1934	47,536	2,222	5,390	1,930	9,542
1944	212,083	12,378	23,899	6,826	43,103
United States:					
1914	7,194,487	214,000	660,000	240,000	1,114,000
1934	5,794,177	270,000	515,000	260,100	1,045,100
1944	12,359,270	616,982	1,265,477	626,414	2,508,873

The tonnage of plant food was calculated from the materials used to make mixed fertilizers in continental United States (table 5) and the average plant-food content of each material (table 10). This computation indicates that 313,193 tons of nitrogen, 876,511 tons of available phosphoric acid, and 570,301 tons of potash were consumed in the 1944 fiscal year. These figures check very satisfactorily with the 312,859 tons of N, 870,950 tons of P_2O_5, and 567,260 tons of K_2O calculated from the tons of the different grades of mixed fertilizer sold. Inasmuch as the two sets of figures are derived from entirely different basic data they tend to confirm each other.

TABLE 10.—*Approximate average plant-food content of fertilizers consumed in 1943–44*

Class and material	N	P_2O_5	K_2O
	Percent	*Percent*	*Percent*
Chemical nitrogen:			
Ammonia and solutions	38.0	----	----
Ammonium nitrate	32.5	----	----
Ammonium sulfate	20.7	----	----
Cyanamid	21.0	----	----
Miscellaneous chemical N [1]	37.7	----	----
Nitrate of soda-potash	15.0	----	15.0
Sodium nitrate	16.0	----	----
Organics:			
Acidulated fish	6.0	5.0	----
Castor pomace	5.0	2.0	2.0
Cocoa byproducts	3.0	2.0	1.0
Cottonseed meal	6.0	2.0	2.0
Dried fish scrap	8.0	6.0	----
Dried manures	2.0	2.0	2.0
Garbage tankage	3.0	2.0	1.0
Guano	7.0	3.0	2.0
Miscellaneous organics [2]	5.0	2.0	2.0
Process tankage	8.0	----	----
Sewage sludge, activated	5.8	2.5	----
Sewage sludge, other	2.5	1.5	.5
Tung meal	5.0	2.0	2.0
Phosphates:			
Ammonium phosphates	14.2	29.7	----
Bonemeal	3.0	25.0	----
Double superphosphate	----	45.2	----
Miscellaneous phosphates [3]	----	20.0	----
Superphosphate	----	[4]19.1	----
Wet-mixed base goods	3.0	14.5	----
Potash:			
Manure salts	----	----	25.1
Miscellaneous potash [5]	----	----	25.0
Potassium chloride (muriate)	----	----	60.5
Potassium sulfate [6]	----	----	39.3
Tobacco stems	2.0	.5	6.0
Fillers and conditioners:			
Peanut-hull meal	1.0	----	----
Peat	1.0	----	----
Phosphate rock	----	[7]3.0	----
Mixed fertilizers:			
All	3.71	10.38	6.75

[1] Ammonium nitrate-limestone mixtures, urea, etc.

[2] Hoof-and-horn meal, dried blood, various seed meals, animal tankage, etc.

[3] Ammoniated superphosphate, basic lime phosphate, base goods, calcined phosphate rock, phosphoric acid, precipitated bone, and spent bone black.

[4] Used in making mixed fertilizers. The average P_2O_5 content of all normal superphosphate consumed was 19.38.

[5] Cement-mill dust, wood ashes, cotton-hull ashes, etc.

[6] Including sulfate of potash-magnesia.

[7] Available. Total P_2O_5 about 30.

LITERATURE CITED

PRINTED PUBLICATIONS

(1) ANONYMOUS.
1944. THE AMERICAN FERTILIZER HAND BOOK: THE STANDARD REFERENCE BOOK AND DIRECTORY OF THE COMMERCIAL FERTILIZER INDUSTRY AND ALLIED TRADES. [192] pp., illus. Philadelphia.

(2) ARIZONA AGRICULTURAL EXPERIMENT STATION.
1945. SEVENTH ANNUAL REPORT OF THE ARIZONA FERTILIZER CONTROL OFFICE, YEAR ENDING DECEMBER 31, 1944. Ariz. Agr. Expt. Sta. Spec. Bul., 15 pp., illus.

(3) ARKANSAS DEPARTMENT OF REVENUES.
1944. FERTILIZER SHIPMENTS IN ARKANSAS BY COUNTIES FOR THE FISCAL YEAR ENDING JUNE 30, 1944. Ark. Dept. Rev., 1 p.

(4) BAILEY, E. M.
1944. COMMERCIAL FERTILIZER REPORT FOR 1944. Conn. Agr. Expt. Sta. Bul. 483, 48 pp.

(5) BERRY, R. C.
1944. ANALYSES OF FERTILIZERS. *In* Va. Dept. Agr. and Immigr. Monthly Bul. 428: 29–36.

(6) CALIFORNIA DEPARTMENT OF AGRICULTURE.
1944. COMMERCIAL FERTILIZERS, AGRICULTURAL MINERALS 1943. Calif. Dept. Agr. Spec. Pub. 203, 81 pp.

(7) CATHCART, C. S.
1945. ANALYSES OF COMMERCIAL FERTILIZERS, MANURES, AND AGRICULTURAL LIME, 1944. N. J. Agr. Expt. Sta. Insp. Ser. 17, 29 pp.

(8) CLAPP, G. R.
1944. ANNUAL REPORT OF THE TENNESSEE VALLEY AUTHORITY FOR THE FISCAL YEAR ENDED JUNE 30, 1944. 180 pp. Washington.

(9) DELAWARE STATE BOARD OF AGRICULTURE.
1944. STATE LABORATORY FERTILIZER, FEED AND ICE CREAM REPORT: JULY–DECEMBER 1943. Del. State Bd. Agr. Quart. Bul. 33 (4): 8–13.

(10) ———
1944. STATE LABORATORY FERTILIZER, FEED AND SEED REPORT: JANUARY–JUNE 1944. Del. State Bd. Agr. Quart. Bul. 34 (2): 8–17.

(11) DESZYCK, E. J., and HAVERN, J. J.
1944. INSPECTION OF FERTILIZERS MADE FOR THE STATE DEPARTMENT OF AGRICULTURE AND CONSERVATION. R. I. Agr. Expt. Sta. Ann. Fert. Cir., 24 pp.

(12) FLORIDA DEPARTMENT OF AGRICULTURE, FERTILIZER STATISTICAL DIVISION.
1943–44. CONSUMPTION OF FERTILIZER MATERIALS BY COUNTIES IN FLORIDA. . . . Fla. Dept. Agr. [Monthly Rpts., July 1943–June 1944], 1 p.

(13) FRAPS, G. S., and OGIER, T. L.
1944. COMMERCIAL FERTILIZERS IN 1943–44. Tex. Agr. Expt. Sta. Bul. 662, 28 pp.

(14) GEORGIA DEPARTMENT OF AGRICULTURE.
1945. COMMERCIAL FERTILIZERS INSPECTED AND ANALYZED IN THE STATE OF GEORGIA, YEAR 1944. Ga. Dept. Agr. Bul. 129, 75 pp.

(15) GRIEM, W. B.
1944. COMMERCIAL FERTILIZERS — 1944. Wis. Dept. Agr. Bul. 246, 34 pp.

(16) HALVORSON, H. A.
1945. 1944 FERTILIZER ANALYSES AND REGISTRATIONS. Minn. Dept. Agr., Dairy and Food Bul., 51 pp.

(17) JONES, W. C.
1943–44. ANALYSES OF FERTILIZERS. *In* Va. Dept. Agr. and Immigr. Monthly Buls. 418–427, inc.

(18) LOUISIANA DEPARTMENT OF AGRICULTURE AND IMMIGRATION.
1945. REPORT OF ANALYSIS OF COMMERCIAL FERTILIZERS. La. Dept. Agr. and Immigr. Fert. Rpt., Season 1943–1944, 42 pp.

(19) LUDWICK, R. W., and ELLIOTT, L. T.
1945. COMMERCIAL FERTILIZERS. N. Mex. Feed and Fert. Control Off. 15th Ann. Rpt., 8 pp.

(20) MARYLAND STATE INSPECTION AND REGULATORY SERVICE.
1944. COMMERCIAL FEEDS, FERTILIZERS AND AGRICULTURAL LIMING MATERIALS. Md. State Bd. Agr. Control Ser. Bul. 189, 85 pp.

(21) ———
1944. COMMERCIAL FEEDS, FERTILIZERS AND AGRICULTURAL LIMING MATERIALS. Md. State Bd. Agr. Control Ser. Bul. 191, 115 pp.

(22) MASSACHUSETTS FERTILIZER CONTROL SERVICE STAFF.
1944. INSPECTION OF COMMERCIAL FERTILIZERS AND AGRICULTURAL LIME PRODUCTS. Mass. Agr. Expt. Sta. Control Ser. Bul. 122, 28 pp.

(23) MAYO, R. V.
1944. SERVICIO DE INSPECCION DE ABONOS Y ALIMENTOS CONCENTRADOS, 1942–43. P. R. Dept. Agr. and Com., 26 pp.

(24) MEHRING, A. L., BAILEY, E., and WALLACE, H. M.
1944. A SURVEY OF FERTILIZER GRADES AND PLANTFOOD CONSUMPTION IN THE UNITED STATES FOR THE YEAR ENDED JUNE 30, 1943. Natl. Fert. Assoc. 20th Ann. Conv. Proc., 74 pp.

(25) ——— and VINCENT, G.
1943. FERTILIZER CONSUMPTION IN 1941 AND TRENDS IN USAGE. U. S. Dept. Agr. Cir. 689, 55 pp., illus.

(26) MILLER, M. F., HAIGH, L. D., COWAN, E. W., and others.
1944. FERTILIZER INSPECTION, ANALYSIS AND USE; 1943. Mo. Agr. Expt. Sta. Bul. 480, 43 pp.

(27) MISSISSIPPI DEPARTMENT OF AGRICULTURE.
1944. COUNTY FERTILIZER DATA: MIXED GOODS AND MATERIALS JULY 1, 1943 THROUGH JUNE 30, 1944. Miss. Dept. Agr., 1 p.

(28) ———
1944. REPORT OF ANALYSES OF COMMERCIAL FERTILIZERS AND FERTILIZER MATERIALS 1943. Miss. Dept. Agr., 16 pp.

(29) NATIONAL FERTILIZER ASSOCIATION.
1946. RECORD FERTILIZER CONSUMPTION IN 1945. Fert. Rev. 21 (2): 11–14, illus.

(30) NEW YORK DEPARTMENT OF AGRICULTURE AND MARKETS.
1944. REPORT OF ANALYSES OF COMMERCIAL FERTILIZERS AND LIME MATERIALS SOLD IN NEW YORK STATE JANUARY 1 TO DECEMBER 31, 1943. N. Y. Dept. Agr. and Markets Bul. 347, 37 pp.

(31) NORTH CAROLINA DEPARTMENT OF AGRICULTURE.
1943. ANALYSES OF COMMERCIAL FERTILIZERS. N. C. Dept. Agr. Bul., Sept. 1943, 359 pp.

(32) PENNSYLVANIA DEPARTMENT OF AGRICULTURE.
1944. FERTILIZER REPORT FOR THE YEAR 1943. Pa. Dept. Agr. Bul. 596, 20 pp.

(33) QUACKENBUSH, F. W., FORD, O. W., CARTER, A. S., and others.
1944. INSPECTION OF COMMERCIAL FERTILIZERS. Ind. Agr. Expt. Sta. Cir. 299, 77 pp., illus.

(34) SIMMS, P.
1944. FERTILIZER AND FERTILIZER MATERIAL. Ala. Dept. Agr. and Indus. Dept. Bul. 46, 88 pp.

(35) SMITH, T. O., and DAVIS, H. A.
1944. INSPECTION OF COMMERCIAL FERTILIZERS. . . . N. H. Agr. Expt. Sta. Bul. 353, 7 pp.

(36) TAYLOR, J. J.
1944. ANNUAL REPORT STATE CHEMIST OF FLORIDA, YEAR ENDING DECEMBER 31, 1943: PART 1, FERTILIZERS. 106 pp.

(37) TOBEY, E. R.
1944. COMMERCIAL FERTILIZERS, 1944. Maine Agr. Expt. Sta. Off. Insp. 193, 86 pp.

(38) TURNER, J. D., ALLEN, H. R., and GAULT, L.
1945. COMMERCIAL FERTILIZERS IN KENTUCKY IN 1944. Ky. Agr. Expt. Sta. Regulat. Ser. 42, 51 pp.

(39) UNITED STATES BUREAU OF MINES.
1945. MINERALS YEARBOOK. U. S. Bur. Mines Min. Yearbook 1943, 1626 pp.

(40) WALKER, L. S., and BOYCE, E. F.
1944. REPORT ON INSPECTION OF COMMERCIAL FERTILIZERS AND AGRICULTURAL LIME PRODUCTS FOR 1944. Vt. Agr. Expt. Sta. Bul. 516, 12 pp.

(41) WEBB, H. J.
1944. INSPECTION AND ANALYSIS OF COMMERCIAL FERTILIZERS. S. C. Agr. Expt. Sta. Bul. 353, 121 pp.

(42) WEST VIRGINIA DEPARTMENT OF AGRICULTURE.
1943. REPORT ON INSPECTION WORK, COMMERCIAL FERTILIZERS AND LIMES. W. Va. Dept. Agr. Bul. (n. s.) 36, 12 pp.

PROCESSED MATERIAL

(1p) AGRICULTURAL ADJUSTMENT AGENCY.
1943–44. SUMMARY OF CONSERVATION MATERIALS ORDERED AND DELIVERED. . . . Agr. Adjust. Agency [Monthly Rpts. July 1943–June 1944], 3 pp.

(2p) AMERICAN POTASH INSTITUTE.
1944. DELIVERIES OF AGRICULTURAL POTASH SALTS BY STATES, JUNE 1943 TO MAY 1944. Amer. Potash Inst. E–71, 4 pp.

(3p) BEAR, F. E.
[1945.] [REPORT ON FERTILIZERS SOLD IN NEW JERSEY IN 1944.] N. J. Agr. Expt. Sta. Soils Dept., 1 p.

(4p) BOPST, L. E.
[1945.] MARYLAND FERTILIZER FACTS FOR 1944. Md. Insp. and Regulat. Serv., 6 pp.

(5p) COX, A. J.
1944. TONNAGES OF MIXED COMMERCIAL FERTILIZERS USED IN CALIFORNIA DURING JULY-DECEMBER 1943. Calif. Bur. Chem. Announc. FM–96, 1 p.

(6p) Cox, A. J.
1944. KINDS AND AMOUNTS OF COMMERCIAL FERTILIZERS USED IN CALIFORNIA DURING JULY-DECEMBER 1943. Calif. Bur. Chem. Announc. FM–97, 2 pp.

(7p) DeTurk, E. E.
1944. FERTILIZERS, FERTILIZER MATERIALS AND ROCK PHOSPHATE USED IN ILLINOIS IN 1943. Ill. Agr. Expt. Sta., Dept. Agron., 2 pp.

(8p) Garrett, J. C.
1944. REPORT ON FERTILIZERS USED IN ALABAMA, SEASON OF 1944, BY COUNTIES. U. S. Bur. Agr. Econ. and Ala. Dept. Agr. and Indus., coop., 1 p.

(9p) Griem, W. B.
1945. WISCONSIN 1944 COMMERCIAL FERTILIZER SUMMARY. Wis. Dept. Agr., 1 p.

(10p) Idaho Agricultural Extension Service, Soils Division.
[1945.] TOTAL TONNAGE OF COMMERCIAL FERTILIZER SOLD IN IDAHO FROM JULY 1, 1943 TO JUNE 30, 1944. Idaho Agr. Ext. Serv., 1 p.

(11p) Iowa State College, Department of Agronomy.
1944. FERTILIZER SALES IN IOWA JULY 1, 1943 TO DECEMBER 31, 1943. Iowa State Col., 1 p.

(12p) Kansas State Board of Agriculture.
1945. ANALYSES OF OFFICIAL SAMPLES OF FERTILIZER COLLECTED DURING 1944. Kans. State Bd. Agr., 3 pp.

(13p) ———
1945. TONNAGE OF COMMERCIAL FERTILIZER REPORTED BY MANUFACTURERS AS SHIPPED TO KANSAS DURING THE YEAR 1944, BY COUNTIES. Kans. State Bd. Agr., 1 p.

(14p) Louisiana Department of Agriculture and Immigration.
[1944.] TONNAGE SHOWING THE DIFFERENT GRADES OF FERTILIZER SHIPPED IN THE STATE OF LOUISIANA FROM SEPTEMBER 1, 1943 TO AUGUST 31, 1944. La. Dept. Agr. and Immigr., 1 p.

(15p) Michigan State College, Soil Science Department.
[1945.] TONNAGE OF DIFFERENT GRADES OF FERTILIZER SOLD IN MICHIGAN, 1944. Mich. State Col., 1 p.

(16p) Missouri College of Agriculture.
1944. SUMMARY REPORT: GRADES NAME AND TONNAGE OF COMMERCIAL FERTILIZER SHIPMENTS INTO MISSOURI, FALL 1943. Mo. Col. Agr., 1 p.

(17p) North Carolina Department of Agriculture.
[1944.] FERTILIZER SALES BY GRADES IN ORDER OF TONNAGE JULY 1, 1943-DECEMBER 31, 1943. N. C. Dept. Agr., 2 pp.

(18p) ———
[1944.] FERTILIZER SALES BY GRADES IN ORDER OF TONNAGE JANUARY 1, 1944-JUNE 30, 1944. N. C. Dept. Agr., 2 pp.

(19p) Ohio State University, Department of Agronomy.
[1944.] FERTILIZER SALES IN OHIO IN 1943. Ohio State Univ., 3 pp.

(20p) ———
[1945.] FERTILIZER SALES IN OHIO JANUARY 1 TO JUNE 30, 1944. Ohio State Univ., 2 pp.

(21p) [Oklahoma Department of Agriculture.]
[1944.] FERTILIZER SALES IN OKLAHOMA BY ANALYSES JULY 1, 1943, TO JUNE 30, 1944. Okla. Dept. Agr., 1 p.

(22p) UNITED STATES BUREAU OF THE CENSUS.
1944–45. SUPERPHOSPHATE. U. S. Dept. Com. Rpts., 4 pp.

(23p) VANDECAVEYE, S. C.
1945. FERTILIZER TONNAGE SALES SURVEY REPORT FOR WASHINGTON FOR JULY 1, 1943 TO JUNE 30, 1944. Wash. Agr. Expt. Sta. Mimeograph Cir. 26, 5 pp.

(24p) WEBB, H. J.
1944. TONNAGE REPORT JULY 1, 1943 THROUGH JUNE 30, 1944. S. C. Dept. Fert. Insp. and Anal., 1 p.

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